Project Summary Information

Date: **4 April 2016**

Title:	**Standard Architecture for Soldier Systems- Power (STASS)**
Contracting Agency:	**European Defence Agency (EDA)**
Contract Number:	**15.CAT.OP.071**
Project Duration:	**17 Sept. 2015 - 19 Oct. 2016**
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Companies Involved:	**DNV GL Energy (The Netherlands)**
	Fraunhofer Institute for Chemical Technology (Germany)
	Larimart S.p.A (Italy)
	Rheinmetall Defence Electronics GmbH (Germany)

Background

The design of the STASS shall promote interoperability and interchangeability for national dismounted soldier programmes both at the system level and the component level. The STASS shall allow to equip the soldier for each mission with equipment that is readily interchangeable. The design shall also consider the data distribution concept in order to suggest a predisposition to be integrated in a system with reduced cabling effort.

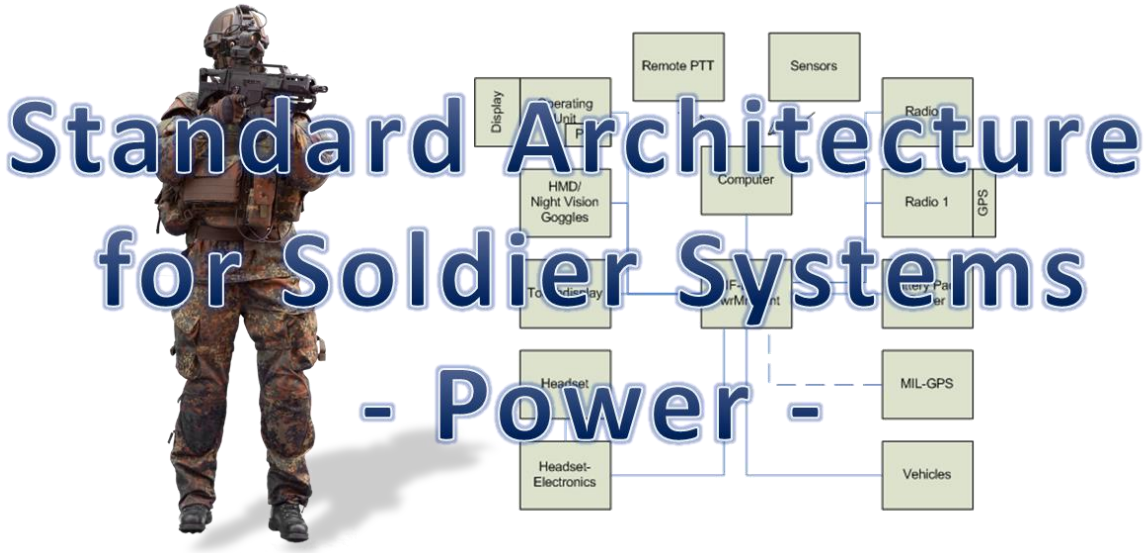
The design of the STASS shall foster harmonization. It shall be based on a harmonized on-the-man general concept of open power architecture for soldier systems covering the aspects described below. It shall allow for a modular approach to support different soldier's equipment configurations as required by EU Member States participating in the activities of the European Defence Agency (pMS). This general concept shall be supported by the development of operational, system and technical architectural views.

There are currently several soldier's equipment programmes running in Europe, such as FELIN (FR), IDZ-ES (DE), Soldato Futuro (IT), TITAN (PL), COMFUT (ES) and FIST (UK). Most of them are still in a prototyping and field test stage and can thus still be influenced. These programmes resulted in a broad range of very different approaches which grew out of the individual national developments and are only loosely synchronised between the nations. As there are a few nations which already fielded their soldier

system, their approaches and lessons learned should be considered on a European level as well as in the other nations.

The design of the STASS shall also be geared towards standardisation. It shall thus be based on a harmonized concept, which must be supported by a roadmap to establish a standard based on it. Open Architectures have been used for standardizing the individual aspects of systems in order to guide component developers. These require much lower integration efforts while, at the same time, increase component production numbers. Such architecture shall be developed in the design as a Standard Architecture for Soldier Systems (STASS). At present, all standardization options are possible, including via national mechanisms, NATO or the European Standardization Organization.

However, since all pMS partaking in the Capability Technology (CapTech) Ground Systems activities are heavily involved in the NATO Dismounted Soldier Systems work, synchronization and complementarity with NATO standardization activities should be sought. Therefore, existing standardisation activities, such as UK General Soldier Architecture, NATO STANAGs and others, as applicable, shall be analysed and taken into account for the design of the STASS. A cost-benefit analysis for the development and the implementation of such a standard shall be conducted.



Technological innovation in conjunction with operational effectiveness and cost efficiency

The STASS to be designed shall also meet the following requirements. It shall:

- reduce the whole life cost of ownership.
- ensure that the architecture and infrastructure are applicable to current and future systems.
- provide interfaces that comply with publically available open standards.
- promote third party competition by providing modular components.
- promote innovation and diversity.
- allow incremental improvement of systems.
- allow technology insertion whilst minimizing integration costs and reducing the burden on the dismounted soldier.
- reduce the burden on the individual soldier from a weight, cognitive and thermal perspective.

- make best use of commercial-off-the-shelf products (COTS).
- improve operational effectiveness.
- implement functionality, wherever possible, in software in order to reduce the burden.
- specify the minimum possible to achieve the aims without hampering innovation.

Comprehensiveness

The design of the STASS shall be comprehensive, but focus mainly on the electrical power aspects of a soldier system within a future standard architecture. This includes at least the following aspects.

Power sources

Mobile power supplies remain a debated topic in research. These range from batteries to fuel cells but may also use energy harvesting, e.g. from devices fitted to the knee joints.

Power distribution

Power distribution may be implemented using power wires, power over Ethernet, power conducting material in fabrics, or remote power transmission. If necessary, different voltages may be needed for different components, e.g. the radio may need a higher voltage than a GPS receiver in order to optimally generate the necessary electro-magnetic radiation.

Power interfaces and connectors

Selecting voltages, maximal current and power quality together with connectors for standardisation and with a minimum size, enables easy integration of components into the power network.

Power conditioning

Power may need to be conditioned such that the provided voltages or currents are within certain limits and the power supply provides the necessary power quality.

Power management

Depending on the actual operational need for different parts of the soldier system, some parts might be automatically or manually put into standby or switched off in order to save power, this is commonly referred to as graceful degradation control. Using the power wisely is critical to the necessary usage time and the requirement for low weight and size, especially for the power sources.

Power advice

The user needs to be informed about the status of the power sources and the current consumption profile such that he is able to judge the remaining operating time.

Power control (e.g. user control with respect to power consumption)

The user shall be able to control power consumption and to switch of consumers or put them into standby manually.

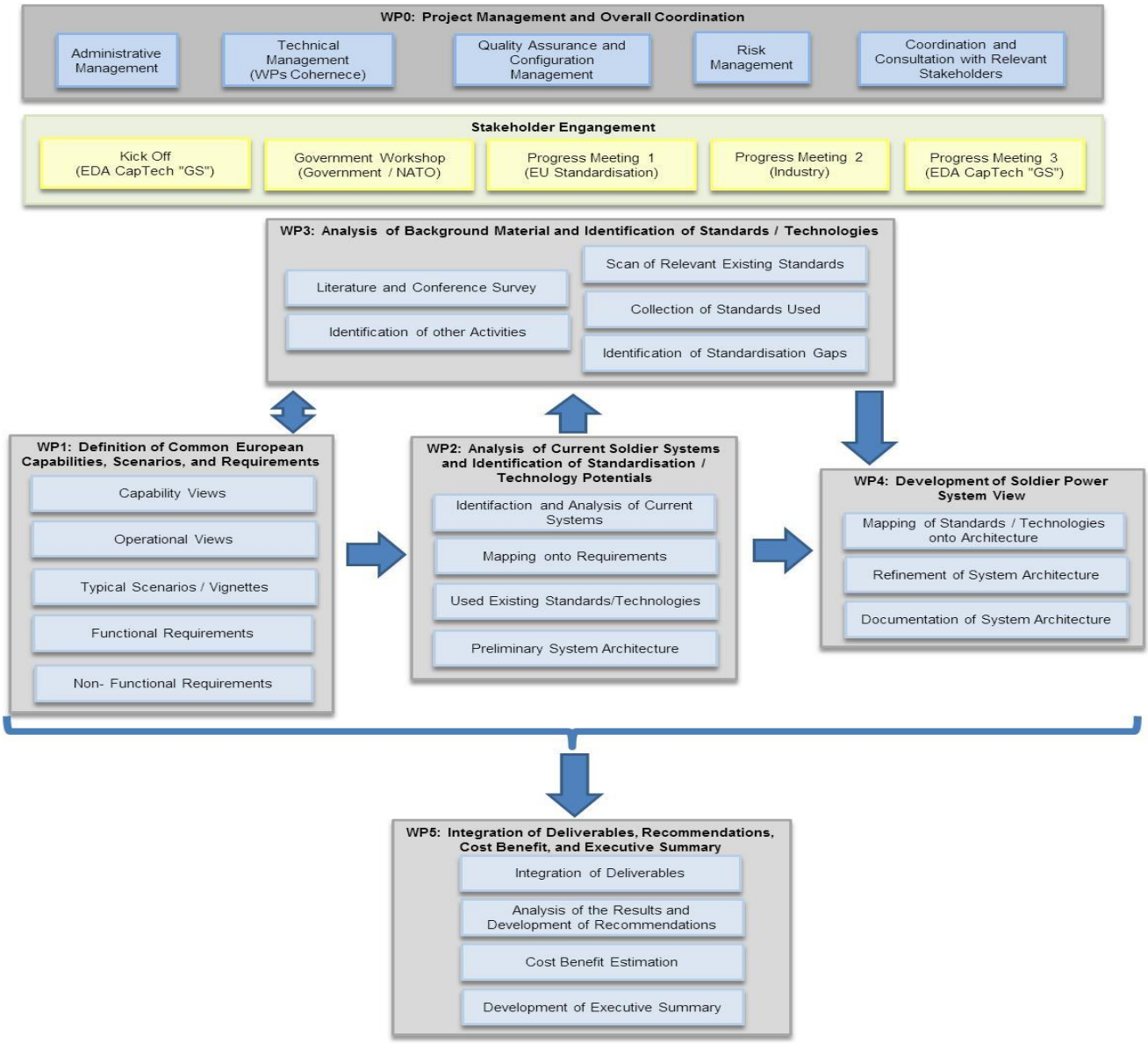
Power Charging /Fuel Supply

Charging or fuel supply in case of fuel cells needs to be considered and high flexibility is required in order to refill the power source, preferably without a specific device, from a variety of power supplies including the connection to a vehicle.

All these aspects needs to be developed in greater detail and a harmonised European approach shall be recommended. Especially, size, weight, optimized usage power and the possibility to be easily harmonized with a common data bus is key to a successful system.

Approach

All work package carried out iteratively (STASS Design v1, v2, and v3) providing more and more mature and comprehensive views.

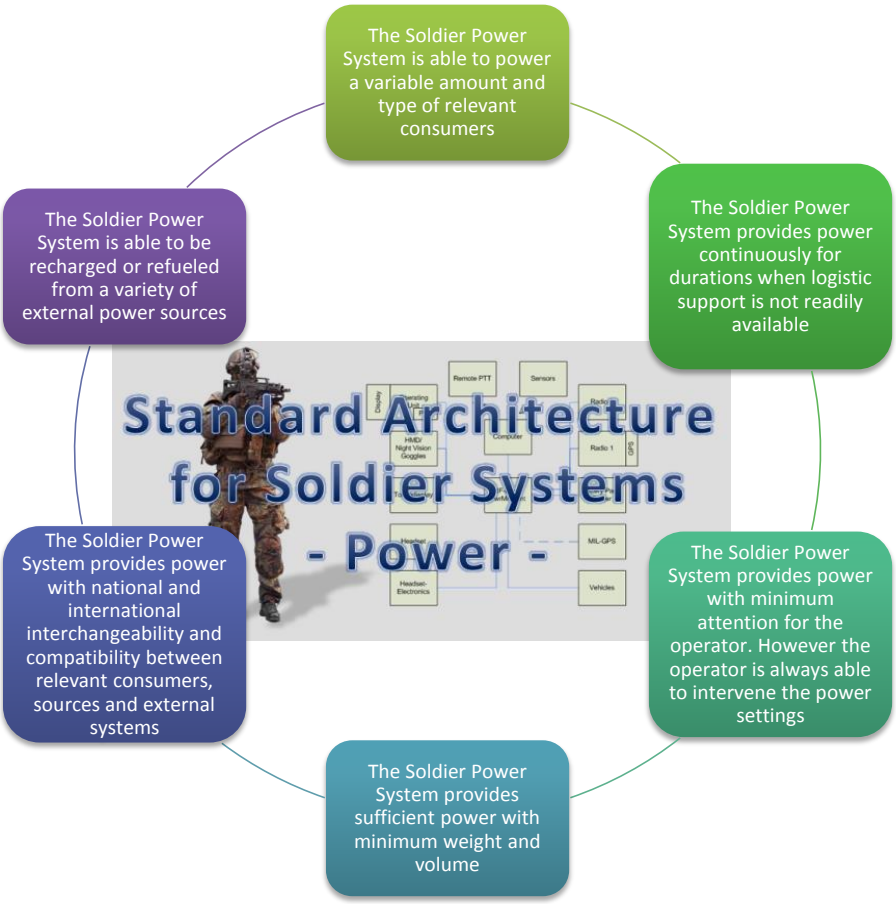


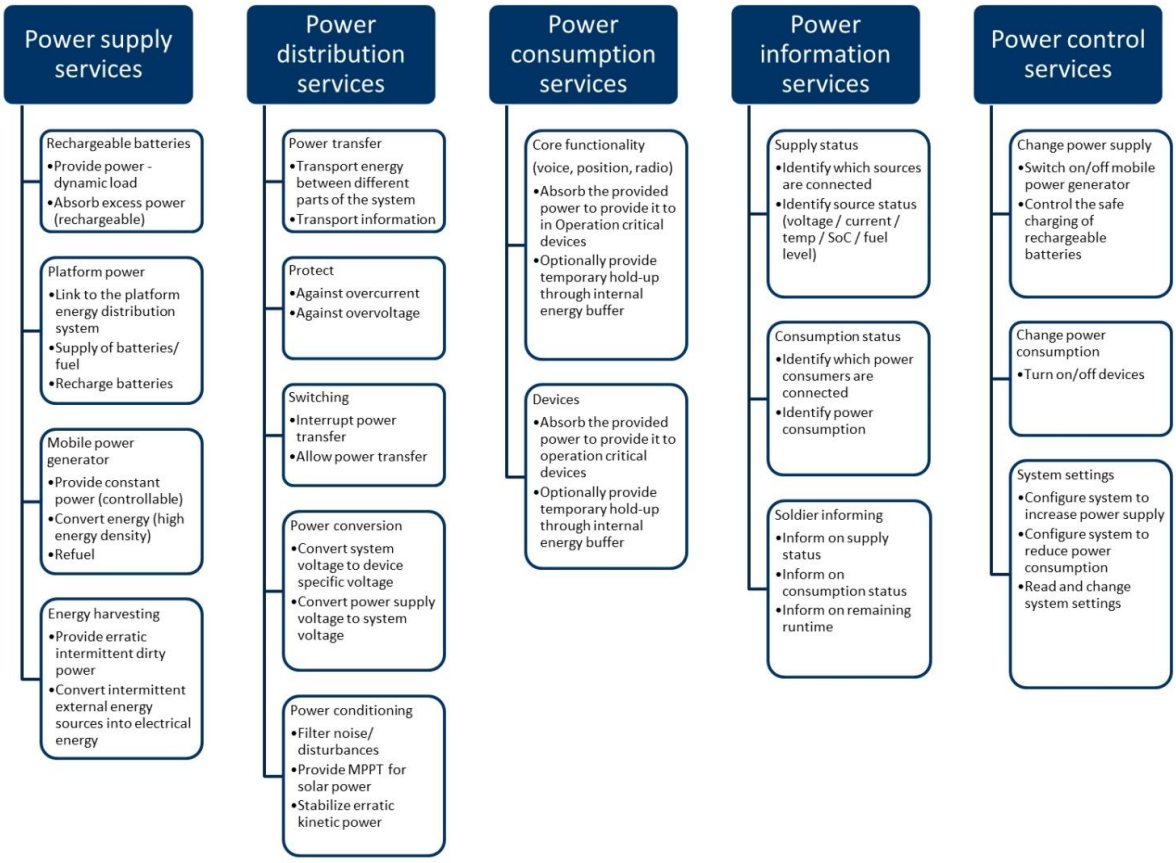
WP0 "Project Management and Overall Coordination" (lead: RDE)

WP0 manages and coordinates the study and ensures the timely delivery of the results. It organizes the engagement with the stakeholders.

WP1 "Definition of Common European Capabilities, Scenarios, and Requirements" (lead: RDE)

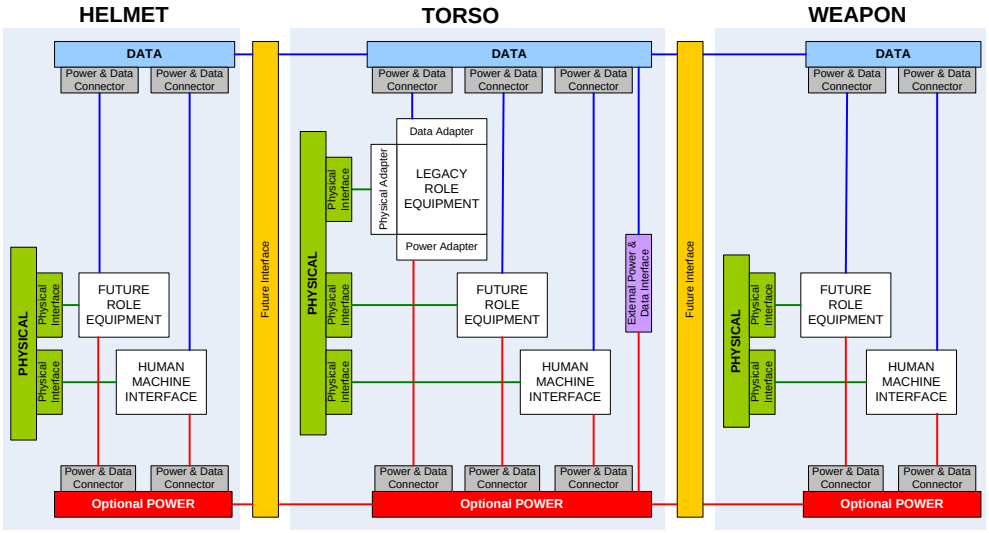
In WP1, the NATO Capability Views and the NATO Operational Views are developed. Also a few typical scenarios or vignettes are formulated and functional (NATO Service-Oriented Views) and non-functional requirements are harmonized.





WP2 "Analysis of Current Soldier Systems and Identification of Standardisation/Technology Potentials" (lead: Larimart)

Current soldier systems as far as the information is available to the study team are analysed. Especially the German IdZ-ES, the Dutch VOSS, and the Italian Soldato Futuro are considered as study team members are directly involved with their development. Other national programs are addressed through e.g. involvement in NATO Working Groups. Architectural aspects with respect to power, used and potential standards / technologies are harmonized. WP2 results in draft NATO System Views derived from existing systems.



WP3 "Analysis of background material and identification of standards / technologies" (lead: FhG ICT)

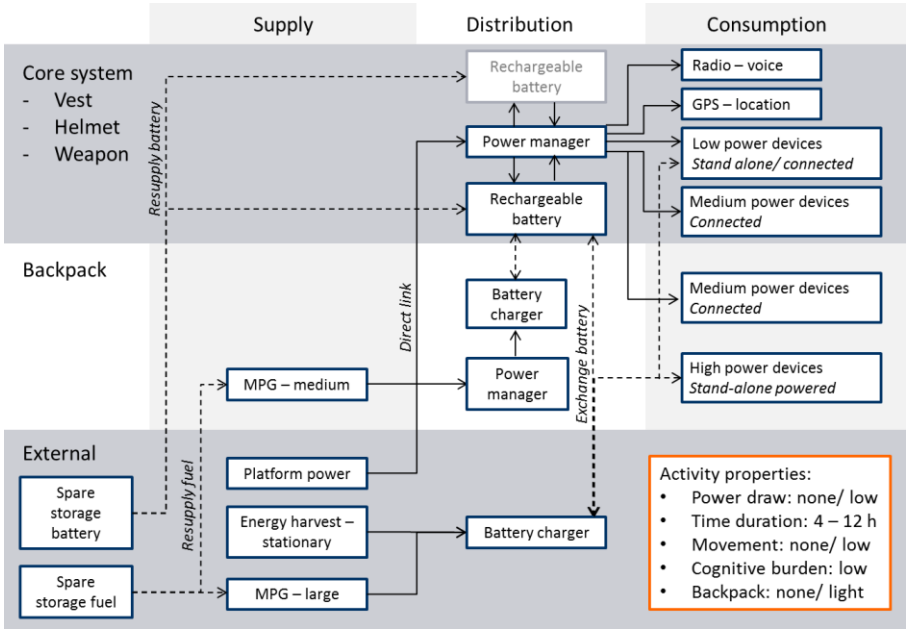
WP3 analyses the current state of technology and relevant activities and programs. It also identifies relevant standards and technologies which results in the NATO Technical Views.

	Small 	Central Power System 	Large 
Energy (Wh)	< 5 Wh	50 – 150 Wh	> 200 Wh
Power (W)	< 1 W	1 – 10 W	> 10 W
Weight (g)	1 – 40 g	0.5 – 1 kg	1 – 4 kg
Volume (L)	0.01 – 0.04 L	0.1 – 1.3 L	> 1 L

	Wind 	Solar - Large 	Solar - Small	Backpack kinetic 	Knee kinetic 	Heel kinetic
Power (W)	100 - 700 W	50 – 200 W	1 – 15 W	8 – 14 W	1 W	
Weight (kg)	15 – 20 kg	1 – 3 kg	?	1 – 2 kg		
Volume (L)						
Energy Harvesting Category	Stationary - Connected to charger		Mobile - Connected to torso			

WP4 "Development of Soldier Power System View" (lead: DNV GL)

WP4 will refine the draft NATO System Views (considering output of WP1, WP2, and WP3) incl. the mapping of standards and technologies onto the views.



WP5 "Integration of Deliverables, Recommendations, Cost Benefit, and Executive Summary" (lead: RDE)

WP5 carries out a cost benefit analysis and formulates the publishable Executive Summary. It integrates deliverables and makes recommendations